

# NATURAL RESOURCES CONSERVATION SERVICE

## CONSERVATION PRACTICE STANDARD

### WETLAND RESTORATION

(Ac.)

CODE 657

#### DEFINITION

The rehabilitation of a degraded wetland or the reestablishment of a wetland so that soils, hydrology, vegetative community, and habitat are a close approximation of the original natural condition that existed prior to modification to the extent practicable.

#### PURPOSE

To restore wetland function, value, habitat, diversity, and capacity to a close approximation of the pre-disturbance by:

- Restoring hydric soil
- Restoring hydrology (depth duration and season of inundation, and/or duration and season of soil saturation).
- Restoring native vegetation (including the removal of undesired species, and/or seeding or planting of desired species).

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies only to natural wetland sites with hydric soils, or problem soils that are hydric, which have been subject to hydrologic or vegetative degradation, or to sites where hydric soils are covered by fill, sediment, or other deposits.

This practice is applicable only where the natural hydrologic conditions, including the hydroperiods, can be approximated by modifying drainage and/or by artificial flooding of a duration and frequency similar to the original, natural conditions.

**For embankment projects, this practice applies only to areas where the predominant slope is two percent or less.**

This practice does not apply:

- to treat point and non-point sources of water pollution (Constructed Wetland - 656);
- to modify an existing wetland where specific attributes are heightened by management objectives, and/or returning a degraded wetland back to a wetland but to a different type than previously existed on the site (Wetland Enhancement - 659);
- to creating a wetland on a site location which historically was not a wetland (Wetland Creation - 658).

#### CRITERIA

##### General Criteria Applicable to All Purposes

The purpose, goals and objectives of the restoration shall be clearly outlined, including soils, hydrology and vegetation criteria that are to be met and are appropriate for the site and the project purposes.

The impact of this practice on existing wetland functions and/or values will be evaluated. All federal, State and local requirements shall be addressed.

The soil, hydrology and vegetative characteristics existing on the site and the contributing watershed shall be documented before restoration of the site begins.

The nutrient and pesticide tolerance of the species planned shall be considered where known nutrient and pesticide contamination exists.

Upon completion of the restoration, the site shall meet soil, hydrology, vegetation and habitat conditions of the wetland that previously existed on the site to the extent practicable.

Sites suspected of containing hazardous waste shall be tested to identify appropriate remedial measures. Sites containing

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hazardous material shall be cleaned prior to the installation of this practice.

Where offsite drainage or the presence of noxious or invasive plant species impact the site, the design shall compensate for these landscape changes (e.g., increased water depth, berms or microtopography).

Invasive species, federal/state listed noxious plant species, and nuisance species (e.g., those whose presence or overpopulation jeopardize the practice) shall be controlled on the site. This includes the manipulation of water levels to control unwanted vegetation. The establishment and/or use of non-native plant species shall be discouraged where possible.

### **Criteria for Hydric Soil Restoration**

Restoration sites will be located on hydric soils, or on problem soils that are hydric.

If the hydric soil is covered by fill, sediment, spoil, or other depositional material, the material covering the hydric soil shall, to the extent technically feasible, be removed.

### **Criteria for Hydrology Restoration**

**General Requirements** - The hydrology (including the timing of inflow and outflow, duration, and frequency) and hydroperiod of the restored site shall approximate the conditions that existed before alteration. This includes affects to hydrology restoration caused by roads, ditches, drains, terraces, etc. within the watershed.

The work associated with the wetland shall not adversely affect adjacent properties or other water users unless agreed to by signed written letter, easement or permit.

A natural water supply should be used to reestablish the site's hydrology that approximates the needs of the wetland type. If this is not possible, an artificial water supply can be used; however, these sources shall not be diverted from other wetland resources (e.g. springs).

Wetland hydrology may be restored by using a variety of measures, including but not limited to embankments, surface drain plugs, subsurface drain plugs, and removal of fill material. These measures may not be needed on sites with degraded wetlands, where the natural hydrology has not been significantly modified.

On sites that have been in long-term agricultural use, grading and shaping can be used as needed to restore the diverse micro

topography that occurs naturally in wetlands. To the extent technically feasible reestablish topographic relief and/or microtopography. Use reference sites within the area to determine desired topographic relief.

Water depths for at least ninety percent of the total area below designed normal water elevation will be three feet or less.

**Embankments** – Embankments may be used to impound water and provide wetland hydrology. Refer to the criteria for embankments in the Pennsylvania Conservation Practice Standard for Pond, Code 378. For embankment projects, water depths for at least sixty percent of the total area below the designed normal water elevation will be eighteen inches or less. The overall bottom slope from the three foot water depth to zero will be convex or flat, but not concave.

Timing and level setting of any water control structures installed will only be used to re-establish the original hydrologic conditions for management of vegetation and for optimum wildlife and fish use.

Existing drainage systems will be utilized, removed or modified as needed to achieve the intended purpose.

**Surface Drain Plugs** - In areas where open ditches were constructed to provide drainage, wetland hydrology may be restored by constructing surface drain plugs, using a pipe riser or other structures within the ditch to control the water level, or by filling a surface drain to the original ground line. Refer to the criteria for embankments when fill will be placed on the ditch banks.

All fill shall be similar to adjacent soil materials and be compacted to achieve the density of the adjacent materials. Crown the fill a minimum of one foot above the top of the lower existing channel bank to account for settling.

The minimum length of surface drain plugs shall be  $(6H + 4)$  feet. "Minimum length" refers to the length as measured along the top of the plug. "H" is measured from the settled top of the embankment to the low point along the centerline of the embankment (fill).

**Subsurface Drain Plugs** - In areas where subsurface drains were used to lower the water table, wetland hydrology may be restored by removing or plugging the drain or replacing the perforated drain with a non-perforated drain.

The minimum length of drain to be removed or plugged shall be as follows:

| Length of Drain | Average Hydraulic Conductivity of Soil |
|-----------------|--|
| 50 feet         | <0.6 inches/hour                       |
| 100 feet        | 0.6 to 2.0 inches/hour                 |
| 150 feet        | >2.0 inches/hour                       |

All envelope filter material or other flow enhancing material shall also be removed for this length. The trench used to alter the drain shall be filled and compacted to achieve a density equal to adjacent natural soil material.

When subsurface drains also function as outlets for other drained areas where drainage is still desired, appropriate measures must be incorporated to keep the upstream drainage systems functional. A non-perforated pipe shall replace the perforated pipe through the wetland area to be restored, and shall extend beyond the wetland in all directions at least the minimum length previously specified for length of drain to be removed or plugged. Drains may also be re-routed around the wetland at the same minimum distances from the wetland, or where topography permits, setting a water control structure at a level that does not affect upstream drainage.

A water control structure may be placed on the inlet of an existing drain. The water control structure shall be attached to a non-perforated conduit that extends at least the minimum length previously specified for length of drain to be removed. The connections of the water control structure and the non-perforated pipe shall be watertight.

**Removal of Fill Material** – On sites where a wetland has been filled by sediment, land shaping, or other activities, the hydrology may be restored by removing the fill material from the site. Fill material shall be removed only to the top of the buried hydric soil, placed on an upland site, and stabilized so that no erosion of the material occurs.

#### **Criteria for Vegetative Restoration**

Hydrophytic vegetation restoration shall be of species typical for the wetland type(s) being established. Preference shall be given to native wetland plants with localized genetic material.

Where natural colonization of pre-identified, selected species will realistically dominate within 5 years, sites may be left to revegetate naturally. If a site has not become dominated by the targeted species within 5 years, active forms of revegetation may be required.

Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the design.

Where planting and/or seeding is necessary, the minimum number of native species to be established shall be based upon the type of vegetative communities present and the vegetation type planned:

- Where the dominant vegetation will be herbaceous community types, a subset of the original vegetative community shall be established within 5 years; or, a suitable precursor to the original community will be established within 5 years that creates conditions suitable for the establishment of the native community. Species richness shall be addressed in the planning of herbaceous communities.

Where the dominant vegetation will be forest or woodland community types, vegetation establishment will include a minimum of six species. Seeding rates shall be based upon percentage of pure live seed that shall be tested within 6 months of planting.

#### **CONSIDERATIONS**

It is expected that for wildlife purposes, planting density and stocking rates will generally be lower than for production purposes, and that the selection of species will generally be different than those used for production purposes.

On sites where woody vegetation will dominate, consider adding 1 to 2 dead snags, tree stumps or logs per acre to provide structure and cover for wildlife and a carbon source for food chain support.

Consider existing wetland functions and/or values that may be adversely impacted.

Consider the effect restoration will have on disease vectors such as mosquitoes.

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Consider effect of volumes and rates of runoff, infiltration, evaporation and transpiration on the water budget.

Consider effects on downstream flows or aquifers that would affect other water uses or users.

Consider the effect of water control structures on the ability of fish or other aquatic species to move in and out of the wetland.

Consider the impact that water surface drawdown will have by concentrating aquatic species such as turtles into diminished pool areas, resulting in potential mortality. The timing and duration of draw-downs are also important to protect amphibians and reptiles from being exposed during extreme cold temperatures.

NOTE: State permits must be obtained to lower pools of impoundments for activities regulated by *other* state permits, or for any impoundment larger than one surface acre. Activities requiring draw down may include construction maintenance or biological manipulation.

Consider establishing herbaceous vegetation by a variety of methods over the entire site, or a portion of the site, and at densities and depths appropriate.

Consider effects on wetlands and water-related resources, including fish and wildlife habitats, which would be associated with the practice.

Consider linking wetlands by corridors wherever appropriate to enhance the wetland's use and colonization by the native flora and fauna.

Consider establishing vegetative buffers on surrounding uplands to reduce sediment and soluble and sediment-attached substance carried by runoff and/or wind.

Consider effects on temperature of water resources to prevent undesired effects on aquatic and wildlife communities.

Consider the effects of soil disturbance and probability of invasion by unwanted species.

For discharge wetlands, consider underground upslope water and/or groundwater source availability.

Consider microtopography and hydroperiod when determining which species to plant.

Consider controlling water levels to prevent oxidation of organic soils and inundated organic matter and materials.

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#### **PLANS AND SPECIFICATIONS**

Specifications for this practice shall be prepared for each site. Specifications shall be recorded using approved specifications sheets, job sheets, narrative statements in the conservation plan, or other documentation. Requirements for the operation and maintenance of the practice shall be incorporated into site specifications. Plans and specifications should be reviewed by staff with appropriate training in design and implementation of wetland restoration.

#### **OPERATION AND MAINTENANCE**

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals shall assure that the intended purpose of the wetland restoration shall not be compromised;

Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) shall be implemented where available and feasible;

Establish an inspection schedule for embankments and structures for damage assessment;

The depth of accumulated sediment should be measured and the accumulations removed when the planned project objectives are jeopardized.

Management actions shall maintain vegetation, and control undesirable vegetation, including noxious and invasive species.

For wildlife habitat purposes, haying and grazing, if justified as a necessary wildlife/wetland management tool, can be used for management of vegetation. Disturbance to ground nesting species shall be minimized.

The control of water depth and duration may be utilized to control unwanted vegetation.

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